

## VITA

### STEVEN F. MAIER

#### PERSONAL

**Born:** March 24, 1943  
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#### EDUCATION

B.A. 1963 - New York University  
M.A. 1965 - University of Pennsylvania  
Ph.D. 1968 - University of Pennsylvania

#### PROFESSIONAL EXPERIENCE

1965-1968	Predoctoral Fellow, National Institute of Mental Health University of Pennsylvania, Department of Psychology
1968-1971	Assistant Professor, Department of Psychology University of Illinois
1971-1973	Associate Professor, Department of Psychology University of Illinois
1973-1975	Associate Professor, Department of Psychology University of Colorado
1975-Present	Professor, Department of Psychology University of Colorado
2001-present	University of Colorado Distinguished Professor University of Colorado
2001-present	Director, Center for Neuroscience University of Colorado

## EDITORIAL AND RESEARCH STUDY SECTION DUTIES

1974-1985	Consulting Editor, <i>Journal of Experimental Psychology: Animal Behavior Processes</i>
1975-1979	Member, Experimental Psychology Research Review Committee, National Institute of Mental Health
1976-1982	Associate Editor, <i>Learning and Motivation</i>
1982-Present	Editor, <i>Learning and Motivation</i>
1988-1991	Member, Biological and Neurosciences Subcommittee, Small Grant Review Committee, National Institute of Mental Health
1991-1993	Member, Psychobiology and Behavior Committee, National Institute of Mental Health
1995-1998	Member, Aids and Immunology Committee National Institute of Mental Health
1998-1999	Member, Integrative, Functional, and Cognitive Neuroscience Committee, National Institutes of Health
1996-present	Editorial Board, <i>Molecular Psychiatry</i>
1997-present	Editorial Board, <i>Brain, Behavior, and Immunity</i>

## RESEARCH GRANTS

### Experimental Psychology.

Training Grant from National Institute of Mental Health  
8/31/86 - 9/1/91, Principal Investigator. TDC: \$380, 248

### Stress and immunity

Grant from the Office of Naval Research  
7/1/86-6/31/88, Principal investigator. TDC: \$200,000

### Learned helplessness and stressor controllability: Behavioral and neurochemical consequences and determinants

Grant from the National Science Foundation  
1/31/86-1/31/89, Principal Investigator. TC: \$240,000

Stressor controllability: Its neurobiology and psychology.  
RSA Grant from the National Institute of Mental Health  
7/01/86 - 6/31/91. \$340, 110

Stress and immunity  
Grant from the Office of Naval Research  
7/1/88-6/31/91, Principal investigator. TDC: \$300,000

Experimental Psychology.  
Training Grant from National Institute of Mental Health  
8/31/91 - 9/1/96, Principal Investigator. TDC: \$416, 030

Stress and immunity: Behavioral and physiological mechanisms.  
Grant from the National Institute of Mental Health  
7/1/91 - 6/30/96 Principal Investigator. \$ 1,007,558

Triazolobenzodiazepines and stress  
Grant from the Upjohn Company  
1/1/92-1/1/93, Principal Investigator. TDC: \$ 28,000

Stressor controllability: Its neurobiology and psychology.  
RSA Grant from the National Institute of Mental Health  
7/01/91 - 6/30/96. \$454, 745

Endogenous anti-opiate analgesia systems  
Grant from the National Institute of Neurological Diseases and  
Stroke  
9/1/93-8/31/97. Co-principal Investigator. TDC: \$528, 257,  
Minority Graduate Student Supplement 995-9/97:\$28,000

Stressor controllability, anxiety, and serotonin.  
Grant from the National Institute of Mental Health  
4/1/93 - 3/31/97, Principal Investigator. TDC: \$ 823, 325

Ovarian hormonal modulation of learned helplessness  
Grant from the National Institute of Mental Health  
7/01/95-6/31/96, Principal Investigator. TDC: \$50,000

Cytokine-to-brain communication: The role of the vagus.  
Grant from the National Institute of Mental Health  
4/1/96 - 9/31/01, Co-Principal Investigator. TDC: \$1,214, 388

Stress and immunity: Behavioral and physiological mechanisms.  
Grant from the National Institute of Mental Health  
7/01/97-12/31/01. Principal Investigator, TDC: \$1,270,400  
Minority Graduate Student Supplement, 7/98-6/01: \$ 48,000

Stressor controllability: Its neurobiology and psychology.  
RSA Grant from the National Institute of Mental Health

7/1/96-6/31/01. TDC: \$ 500, 475

Stressor controllability, anxiety, and serotonin.

Grant from the National institute of Mental Health

4/1/97-3/31/02-07. **MERIT** Award. TDC: till 3/31/02 \$1, 090, 811.

.Minority Graduate Student Supplement 6/97-6/02: \$75,000

Pain facilitation by gp120, an HIV-1 envelope protein.

Grant from the National Institute of Neurological Diseases and Stroke

07/1/99-06/30/04. Co-Principal Investigator. TDC: \$1,280, 434

Minority Graduate Student & Postdoctoral Student Supplements, NIH 1/00-12/03: \$123,000

Stressor controllability, drugs of abuse, and serotonin.

Grant from the National Institute of Drug Abuse

12/01/00-11/30/05. Principal Investigator. TDC: \$1, 175,000,

Allodynic effects of sciatic inflammatory neuritis

Grant from National Institute of Neurological Diseases and Stroke

12/01/00-11/30/05. Co-Principal investigator. TDC: \$1,354,230

Stressor controllability, anxiety, and serotonin.

Grant from the National Institute of Mental Health

4/1/02--3/31/07. **MERIT** Award. TDC:\$1,250,000

Immune activation, hippocampal IL-1 $\beta$ , and memory.

Grant from the National Institutes of Mental Health

04/01/02--03/31/07. Co-Principal Investigator. TDC:\$1,050,000.

Pain control via spinal interleukin-10 gene therapy.

Grant from National Institutes of Drug Abuse

09/01/02-08/31/04. Co-Principal investigator. TDC: \$200,000.

IL-10 gene therapy for aging-associated memory deficits.

Grant from Avigen.

09/15-03-09/14/04. Principal Investigator. TDC \$17,000

Neurobiology of the stress resistant brain.

Grant from the National Institutes of Mental health

03/04-02/09. Co-Principal investigator. TDC \$1, 250,000

Pain control via spinal interleukin-10 gene therapy

Grant from NIDA CEBRA Phase II

09/20/04- 09/19/09 Co-PI. \$1,245,000

Pain facilitation via neuron-to-glia signaling.

Grant from the National Institute of Drug Abuse

03/01/05 – 12/31/09. Co-Principal investigator. TDC \$1,400,000

Pain control via spinal interleukin-10 gene therapy  
Grant from the National Institute of Drug Abuse  
09/20/05 – 09/19/09. Co-Principal investigator. TDC \$1,325,000

Stressor controllability, drugs of abuse, and serotonin.  
Grant from the National Institute of Drug Abuse  
7/01/06-06/30/11. Principal Investigator. TDC: \$1, 250,000

Neuroinflammation, inflammatory challenge, and memory.  
Grant from the National Institute of Aging  
07/01/06-01/01/12. Principal Investigator. TDC: \$1,252,000

Non-human lentiviral models of the neurological complications of AIDS  
Grant from the National Institute of Drug Abuse  
01/01/07-12/31/12. Co-Investigator. TDC \$1,250,000

Stressor Controllability: The Role of the mPFC in Producing Resiliency  
Grant from the National Institute of Mental Health. Principal  
Investigator. 04/01/07-03/31/12. TDC \$1,250,000

Exploring the potential of glia for regulating clinically relevant opioid  
actions, Grant from the National Institute of Drug Abuse. Co-  
Principal Investigator. TDC : \$1,250,000; 2008-2113.

Spinal adenosine modulator: enduring anti-inflammatory action in  
neuropathic pain, Grant form the National Institute of Neurological  
diseases and Stroke. Co-Principal Investigator. TDC: \$500,000.  
9/30/09-8/31/11.

Models and mechanisms for the transition of acute-to-chronic orofacial  
pain. Co-Principal Investigator. Grant from the National Institute of  
Dental and Craniofacial Research. TDC: \$500,000. 9/30/09-  
8/31/11.

Behavioral control, the medial prefrontal cortex, and resilience in the  
face of chronic stress. Principal Investigator. Grant from the  
National Institute of Mental Health. TDC: \$500,000. 9/30/09-  
1/1/12

Opioid analgesics: modulation of trigeminal and spinal glial activation.  
Co-principal Investigator. Grant from NIDCR. 7/1/06-4/30/2011

The role of glucocorticoids and neuroinflammation in mediating the  
effects of stress on drug abuse. Principal Investigator. Grant from  
the Department of Defense. TDC: 713,000. 09/01/11-09/01/14.

Stress, glucocorticoids, and neuroinflammatory priming. Principal Investigator. Grant from the National institutes of Mental Health. TDC: 275,000. 03/01/12- 03/01/14.

Neuroinflammation, Inflammatory Challenge, and Memory. Principal Investigator. Grant from the National institutes of Mental Health. TDC: 1,650,000 4/01-12-03/30/17.

Stressor controllability: The role of the mPFC in producing resiliency. Principal Investigator. Grant from the National institutes of Mental Health. TDC: 1,500,000 09/19/12- 07/31/17.

Stress-induced neuroinflammatory priming: Glucocorticoids, inflammasomes, alarmins. Grant from the National institutes of Mental Health. TDC: 1,450,000 06/01/2016-05/31/2021

**Principal investigator, Ongoing**

*The role of glucocorticoids and neuroinflammation in mediating the effects of stress on drug abuse.*

Stress-induced neuroinflammatory priming: Glucocorticoids, inflammasomes, alarmins. Grant from the National institutes of Mental Health. TDC: 1,450,000 06/01/2016-05/31/2021

Agency: NIH/NIMH. Type R01. 09/19/12- 07/31/17.

The major goal is to understand the role of the mPFC in buffering the organism against the behavioral and neurochemical impact of adverse events.

*Neuroinflammation, inflammatory challenge, and memory.*

Principal Investigator. Steven F. Maier

Agency: NIH/NIA. Type R01. 04/15/12- 04/14/17

The major goal is to understand the role of neuroinflammation in the memory declines that occur with aging, especially after challenge.

Agency: DOD. Type CDMRP. Period: 09/01/14 – 08/31/16

The major goal is to understand the potential neuroinflammatory processes that underlie the cognitive deficits associated with Gulf War Syndrome.

*Gulf War Syndrome.*

Agency: Linda Crnic Center. Period: 03/01-14-02/31/15. The major goal is to explore microglial sensitization in a mouse model of Downs Syndrome. *Microglia and downs Syndrome.*

*Embedded Prefrontal Circuits in Stress Resilience* (M. Baratta and I are both PIs)

Agency: NIH/NIA. Type R21. 09/01/15- 06/30/17

The major goal of this project is to identify prefrontal subcircuits in mediating the long-term neurochemical and behavioral protective effects of behavioral control

**Co-Principal investigator, Ongoing**

*Preventing transition of acute-to-chronic neuropathic pain: models, mechanisms mediators*

Principal investigator: Linda R. Watkins

Agency NIH/NIDCR. Type: RO1. 09/01/11-8/31/17

The focus of this project is to develop new animal models of how acute pain transitions into chronic pain and to begin to explore how this may occur.

*Combating Drug Abuse by Targeting Toll-like Receptor 4 (TLR4)*

Principal investigator: Linda R. Watkins

Agency DOD. Type: CDMRP. /24/2012-9/23/2015

This is a project that explores how glial activation contributes to drug abuse

*Exploration of a novel persistent reversal of pathological pain: mechanisms and mediators*

Principal investigator: Linda R. Watkins

Agency DOD. Type: CDMRP. 01/15/11-1/14/15

This is a project that explores how adenosine 2A agonists induce a remarkably enduring reversal of neuropathic pain.

*A novel approach for effectively treating spinal cord injury pain, improving opioid efficacy & preventing opioid-induced constipation: key role of toll-like receptor 4 (TLR4)*

Principal investigator: Linda R. Watkins

Agency DOD. Type: SCI. 09/30/13-09/29/16

This is a project that explores mechanisms underlying chronic pain arising from spinal cord injury (dorsal root avulsion; spinal cord contusion) and the role that toll like receptor 4 (TLR4) plays in this phenomenon.

The focus of this project is to study rat and mouse models of multiple sclerosis to test if intrathecal interleukin-10 gene therapy can be efficacious as a treatment.

*XT101 for Treatment of Multiple-Sclerosis-Related Symptoms*

Agency: National MS Society. 10/12-9/16

The focus of this project is to study rat and mouse models of multiple sclerosis to test if intrathecal interleukin-

10 gene therapy can be efficacious as a treatment.

*A Novel Approach for Effectively Treating SCI Pain, Improving Opioid Efficacy & Preventing Opioid-induced*

*Constipation: Key Role of Toll-like Receptor 4 (TLR4)*

Agency: Department of Defense. 9/30/2013 – 9/29/2016

The focus of this project is to explore our discovery that treatment with morphine early after SCI trauma

dramatically worsens and extends neuropathic pain via a TLR4-mediated mechanism.

## AWARDS

2016 Grawemeyer Award, 2009 American Psychological Association Award for Distinguished Scientific Contributions, 2004 D.O. Hebb Distinguished Scientific Contributions Award from the American Psychological Association, Cousins Award for Distinguished Research from the Psychoneuroimmunology Research Society, Member Society of Experimental Psychologists, Fellow of AAAS, Fellow of APA, Fellow of APS, Grass Foundation Traveling Neurosciences Scholar, Phi Beta Kappa Traveling Scholar, Graduate Fellowship from NIMH, RCDA from NIMH 1982-1991, RSA from NIMH 1991-present, Distinguished Lecturer University of Colorado, Distinguished Professor, University of Colorado, Neal Miller Distinguished Lecturer, Norman Cousins Distinguished Lecturer, Ida Beam Distinguished Lecturer, Hebb Distinguished Lecturer



## PUBLICATIONS (ABSTRACTS NOT INCLUDED)

### BOOKS

Peterson, C., Maier, S. F., & Seligman, M. E. P. (1993). *Learned helplessness..* New York: Oxford University Press.

Watkins, L. R., & Maier, S. F. (1998). *Cytokines and pain*. Basel: Birkhauser.

### CHAPTERS and EDITED VOLUMES

Maier, S. F., & Levin, R. A. ( 2011). Responding to the challenges of the environment: Stressors, the brain, and work. In R. A. Levin, S. B. Laughlin, C. L. De La Rocha & A. F. Blackwell (Eds.), *Work Meets Life: Exploring the Integrative Study of Work in Living Systems*. Cambridge, MA: The MIT Press, 187-201.

Maier, S. F., Amat, J., Baratta, M. V., Bland, S. T., Christianson, J. C., Thompson, B., Rozeske, R. R., & Watkins, L. R. (2009). The role of the medial prefrontal cortex in mediating resistance and vulnerability to the impact of adverse events. In C. M. Pariante, R. M. Nesse, D. Nutt, & L. Wolpert (Eds.), *Understanding depression: a translational approach*, Oxford University Press, 157-171.

Maier, S. F. & Watkins, L.R. (2009). Neuroimmunology. In G. Bernston and J. Caciopo (Eds), *Handbook of Neuroscience for the Behavioral Sciences*. John Wiley and Sons, 119-136.

Watkins, L.R. & Maier, S.F. Proinflammatory cytokines, Encyclopedic Reference of Pain, Schmidt, R. & Willis, W.D. (Ed.) Springer-Verlag, (2007) CD-Rom.

Milligan, E.D., Ledeboer, A., Sloane, E.M., Busha, D.A. Maier, S.F. & Watkins, L.R. (2007). Glially driven enhancement of pain and its control by anti-inflammatory cytokines. In: DeLeo, J.A., Sorkin, L.S. & Watkins, L.R. (Eds), Immune and Glial Regulation of Pain, Seattle: IASP Press, 2007, pp. 319-340.

Watkins, L.R., Milligan E.D. & Maier, S.F., Mechanisms of glial activation after nerve injury, Handbook of the Senses, Bushnell, C & Basbaum, A. (Eds), Elsevier Press (2007) CD Rom

Ledeboer, A., Sloane, E.M., Milligan, E.D., Langer, S.J., Maier, S.F., Johnson, K.W., Leinwand, L.A., Chavez, R.A. & Watkins, L.R. (2007). Paclitaxel-induced mechanical allodynia in rats is inhibited by spinal delivery of plasmid DNA encoding interleukin-10, *Advances in Pain Research and Therapy*, Flor, H., Kalso, E., Dostrovsky, J.O. (Editors) IASP Press, Seattle,

1870194.

- Milligan, E.D., Maier, S.F. & Watkins, L.R., Inflammatory neuropathy, Encyclopedic Reference of Pain, Schmidt, R. & Willis, W.D. (Ed.) Springer-Verlag, (2007) CD-Rom.
- Watkins, L.R., Wieseler-Frank, J., Hutchinson, M. Ledebor, A., Spataro, L., Milligan, E.D., Sloane, E., & Maier, S.F. (2006). Neuroimmune interactions and pain: the role of immune and glial cells. In *Psychoneuroimmunology*, Ader, R. (Ed.). Academic Press, 393-414.
- Wieseler-Frank, J., Milligan, E.D., Maier, S.F. & Watkins, L.R., Cord glial activation, Encyclopedic Reference of Pain, Schmidt, R. & Willis, W.D. (Ed.) Springer-Verlag, (2007) CD-Rom
- Watkins, L. R., Wiesler-Frank, J., Milligan, E. D., Johnston, I., & Maier, S. F. (2006). Contributions of glia to pain processing in health and disease. *Handbook of Clinical Neurology*, Cervero, F. & Jensen, T. S. (Eds.). Edinburgh: Elsevier Press, **309-324**.
- Watkins, L.R., Milligan E.D. & Maier, S.F. (2007) How do spinal cord glia “know” to become activated in response to peripheral nerve injury?, In *Handbook of the Senses*, Bushnell, C & Basbaum, A. (Eds)., Elsevier, in press.
- Milligan, E.D., Maier, S.F. & Watkins, L.R., Inflammatory neuropathy, Encyclopedic Reference of Pain, Schmidt, R. & Willis, W.D. (Ed.) Springer-Verlag, (2007) CD-Rom
- Watkins, L.R., Wieseler-Frank, J., Hutchinson, M. Ledebor, A., Spataro, L., Milligan, E.D., Sloane, E., & Maier, S.F., Neuroimmune interactions and pain: the role of immune and glial cells, Psychoneuroimmunology, Ader, R. (Ed.), Academic Press (2006) 393-414.
- Watkins, L.R., Wieseler-Frank, J., Milligan, E.D., Johnston, I., & Maier, S.F., Contribution of glia to pain processing in health and disease, Handbook of Clinical Neurology - Pain, Cervero, F & Jensen, T.S. (Eds), Edinburgh: Elsevier Press (2006) 309-324.
- Watkins, L. R. & Maier, S. F. (2005). Glia and pain: Past, present, and future. In *The Paths of Pain 1975-2005*, H. Merskey, J. D. Loeser, & R. Dubner (Eds). IASP Press, 165-177.
- Milligan, E.D., Maier, S.F. & Watkins, L.R. (2004) Sciatic inflammatory neuropathy: a new model for studying neuropathic pain of inflammatory origin. *Pain Research: Methods and Protocols; "Methods of Molecular Medicine"*, D. Luo (Ed.) Humana Press, 67-89.

- Milligan, E.D., Maier, S.F. & Watkins, L.R. (2005) Neuronal-glia interactions in central sensitization, *Seminars in Pain Medicine: Central Sensitization*, Edited by: P. M. Dougherty, W.B. Saunders Co., Philadelphia, PA, in press.
- Wieseler-Frank, J., Milligan, E.D., Maier, S.F. & Watkins, L.R.. Spinal cord glial activation, *Encyclopedic Reference of Pain*, Schmidt, R. & Willis, W.D. (Ed.) Springer-Verlag, in press.
- Milligan, E.D., Maier, S.F. & Watkins, L.R. (2005) Inflammatory neuropathy, *Encyclopedic Reference of Pain*, Schmidt, R. & Willis, W.D. (Ed.) Springer-Verlag, in press.
- Milligan, E.D., Maier, S.F. & Watkins, L.R. (2005). Sciatic inflammatory neuropathy: a new model for studying neuropathic pain of inflammatory origin. *Pain Research: Methods and Protocols; "Methods of Molecular Medicine"*, D. Luo (Ed.) Humana Press, in press.
- Watkins, L.R., Milligan, E.D. & Maier, S.F. (2003) Glial proinflammatory cytokines mediate exaggerated pain states: implications for clinical pain, *Adv. Exp. Med. Biol.: Immune Mechanisms of Pain & Analgesia*, **532**, 1-21.
- Watkins, L.R., Milligan, E.D. & Maier, S.F., (2003) Immune and glial involvement in physiological and pathological exaggerated pain states. In Dostrovsky, J.O., Carr, D.B. & Koltzenberg, M. (Eds), *Advances in Pain Research and Therapy* IASP Press, Seattle, 369-385.
- Maier, S. F., Watkins, L. R., and Nance, D. M. (2001). Multiple routes of action of interleukin-1 on the nervous system. In R. Ader, D. L. Felten, and N. Cohen (Eds.), *Psychoneuroimmunology, Third Edition*. New York, Academic Press, 563-584.
- Maier, S. F. & Watkins, L. R. (2000). Learned helplessness. In A. E. Kazdin (Ed.), *Encyclopedia of Psychology*. New York, NY: Oxford University.
- Maier, S. F., Nguyen, K. T, Deak, T. Milligan, E. D., & Watkins, L. R. (1999). Stress, learned helplessness, and brain interleukin-1. In: R. Dantzer, B. B. Wollmann, & R. Yirmiya (Eds.), *Advances in Experimental Medicine and Biology, Volume 461, Stress, depression, and cytokines*. New York: Plenum Press, 235-250.
- Watkins, L. R., Nguyen, K. T., & Maier, S. F. (1999). Dynamic regulation of pro-inflammatory cytokines: Implications for understanding the effects of stress on cytokines. Stress, cytokines, and cytokine regulation. In: R. Dantzer, B. B. Wollmann, & R. Yirmiya (Eds.), *Advances in Experimental Medicine and Biology, Volume 461, Stress, depression, and cytokines*. New York: Plenum Press, 153-178 .

- Maier, S. F. & Watkins, L. R. (1998). The neurobiology of stressor controllability. In: C. Peterson (Ed.), *The psychology of optimism and hope*. Philadelphia: Templeton Foundation Press, in press.
- Watkins, L. R., & Maier, S. F. (1998). Illness-induced hyperalgesia: Mediators, mechanisms, and implications. In: Watkins, L. R., & Maier, S. F. (1998). *Cytokines and pain*. Basel: Birkhauser, 39-58.
- Watkins, L.R. & Maier, S.F. (1998). Vagal afferent nerve mediates immune signals to the brain. In Y. . Oomura and T. Hori (Eds.), *21st International Symposium on Brain Sciences: Brain & Biodefense*, Karger, Basel, 1998, pp 171-184.
- Maier, S.F., Goehler, L.E., Fleshner, M. & Watkins, L.R. (1998). The role of the vagus nerve in cytokine-to-brain communication, In: *Annals of the New York Academy of Sciences*, **840**, .289-301, New York: New York Academy of Sciences Press.
- Watkins, L. R. & Maier, S. F. (1998). Stress and cytokine-brain interactions. In *New frontiers in stress research, modulation of Brain Function*, A. Levy, E. Grauer, D. Ben-Nathan, & E. R. de Kloet, (Eds.), Chur Switzerland: Harwood Academic Publishers, p. 187-197.
- Maier, S. F., Fleshner, M., & Watkins, L. R. (1998). Neural, endocrine, and immune mechanisms of stress-induced immunomodulation. In *New frontiers in stress research, modulation of Brain Function.*, A. Levy, E. Grauer, D. Ben-Nathan, & E. R. de Kloet(Eds). Chur, Switzerland: Harwood Academic Publishers, p. 175-187.
- Maier, S. F. (1993). Learned helplessness, fear, and anxiety. In C. Stanford & P. Salmon (Eds.), *Stress: From synapse to syndrome*. London: Academic Press, 207-248.
- Maier, S. F. (1993). Learned helplessness. In L. Nadel & R. F. Thompson (Eds.), *Encyclopedia of learning and memory*
- Maier, S. F., & Church, R. M. (Eds.) (1991). Animal timing. *Learning and Motivation*, (Special Edition), **22**, 1-253.
- Maier, S. F. (1991). Stressor controllability, cognition, and fear. In J. Madden (Ed.), *Neurobiology of learning, memory, and affect*. New York: Raven Press, 155-194.
- Warren, D. A., Rosellini, R. A., & Maier, S. F. (1990). Fear, stimulus feedback, and stressor controllability. In G. H. Bower (Ed.), *The psychology of learning and motivation*, Vol. 22. New York, NY: Academic Press, Inc., 167-207.

- Maier, S. F. (1989). Learned helplessness: Event co-variation and cognitive changes. In S. B. Klein & R. R. Mowrer (Eds.), *Contemporary learning theories*. New Jersey: Lawrence Erlbaum Associates, 73-109.
- Desan, P. H., Silbert, L. H., Woodmansee, W. W., & Maier, S. F. (1989). The effects of stress and desipramine upon activity as a model of depression. In O. Zinder & S. Bresnitz (Eds.), *Molecular biology of stress*. New York: Alan R. Liss Inc., 285-296.
- Wasserman, E. A., & Maier, S. F. (Eds.) (1987). Animal memory and cognition. *Learning and Motivation, (Special Edition)*, **18**, 1-146.
- Maier, S. F. (1986). Stressor controllability and stress-induced analgesia. In D. D. Kelly (Ed.), *Stress-induced analgesia* (pp. 55-78). New York: New York Academy of Sciences.
- Maier, S. F., Laudenslager, M. L., & Ryan, S. M. (1985). Stressor controllability, immune function, and endogenous opiates. In F. R. Brush & J. B. Overmier (Eds.), *Affect, conditioning, and cognition: Essays on the determinants of behavior* (pp. 183-201). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Timberlake, W., & Maier, S. F. (Eds.) (1984). Ecological and developmental contexts in the study of learning. *Learning and Motivation (Special Edition)*, **15**, 321-494.
- Maier, S. F. (1984). Learned helplessness and animal models of depression. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, **8**, 435-446.
- Wasserman, E. A., & Maier, S. F. (Eds.) (1983). Contingency, contiguity, and causality. *Learning and Motivation (Special Edition)*, **14**, 381-553.
- Maier, S. F., Drugan, R., Grau, J. W., Hyson, R., MacLennan, A. J., Moye, T., Madden, J. IV, & Barchas, J. D. (1983). Learned helplessness, pain inhibition, and the endogenous opiates. In M. D. Zeiler & P. Harzem (Eds.), *Advances in the analysis of behavior*, Vol. 3 (pp. 275-323). New York, NY: John Wiley & Sons, Ltd.
- Maier, S. F., Drugan, R. C., Grau, J. W., Hyson, R. L., MacLennan, A. J., Madden, J. IV, & Barchas, J. D. (1982). Opioid and nonopioid mechanisms of stress-induced analgesia. In H. Takagi & E. J. Simon (Eds.), *Advances in endogenous and exogenous opioids*. Amsterdam: Elsevier Biomedical Press.
- Maier, S. F., & Jackson, R. L. (1979). Learned helplessness: All of us were right (and wrong): Inescapable shock has multiple effects. In G. H. Bower (Ed.), *The psychology of learning and motivation*, Vol. 13 (pp. 155-218). New York, NY: Academic Press, Inc.
- Maier, S. F. (1975). Conditioning and learning. In P. Groves & K. Schlesinger (Eds.), *Psychology: A dynamic science*. Dubuque: Wm. C. Brown.

Maier, S. F. (1975). Memory. In P. Groves & K. Schlesinger (Eds.), *Psychology: A dynamic science*. Dubuque: Wm. C. Brown.

Seligman, M. E. P., Maier, S. F., & Solomon, R. L. (1971). Unpredictable and uncontrollable aversive events. In F. R. Brush (Ed.), *Aversive conditioning and learning*. New York, NY: Academic Press Inc.

Maier, S. F., Seligman, M. E. P., & Solomon, R. L. (1969). Pavlovian fear conditioning and learned helplessness: Effects on escape and avoidance behavior of (a) the CS-US contingency, and (b) the independence of the US and voluntary responding. In B. A. Campbell & R. M. Church (Eds.), *Punishment*. New York, NY: Appleton-Century-Crofts

## ARTICLES

Daut, R.A., Ravenel, J.R., Watkins, L.R, Maier. S. F, & Fonken, L.K. (2020). The behavioral and neurochemical effects of an inescapable stressor are time of day dependent. *Stress*, in press.

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## CONVENTION PAPERS, ABSTRACTS

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- Fleshner, M., Laudenslager, M. L., Simon, L., & Maier, S. F. Impaired antibody production with defeat in rats. Presented at Society for Neuroscience Meetings, Toronto, **1988**. Society for Neuroscience Abstracts, p. 1283.
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- Woodmansee, W., Desan, P., Ryan, S., Smock, T., & Maier, S. F. Monoamine and metabolite content in rat brain during the estrous cycle, pregnancy, and post-partum. Presented at Society for Neuroscience Meetings, New Orleans, **1987**. Society for Neuroscience Abstracts, p. 408.
- Yuva, L. A., & Maier, S. F. The role of spinal cord monoamines in the production of opioid and nonopioid stress-induced analgesia. Presented at Society for

Neuroscience Meetings, New Orleans, **1987**. Society for Neuroscience Abstracts, p. 1201.

Drugan, R. C., & Maier, S. F. Control versus lack of control over aversive stimuli: Nonopioid-opioid analgesic consequences. National Institute of Drug Abuse Research Monographs, **1986**.

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Maier, S. F. Controllability and pain. Presented at New York Academy of Sciences Symposium on Stress and Pain, New York, NY, **1985**.

Ryan, S., Goodale, H., Weiss, D., & Maier, S. Stress-induced analgesia varies as a function of estrous cycle and sex steroid replacement therapy. Presented at Society for Neuroscience meetings, Dallas, TX, **1985**. Society for Neuroscience Abstracts, p. 128.

Wade, S. E., & Maier, S. F. A specific deficit in spatial learning is caused by repeated but not acute treatment with a cholinergic agonist. Presented at Society for Neuroscience meetings, Dallas, TX, **1985**. Society for Neuroscience Abstracts, p. 379.

Drugan, R. C., McIntyre, T. D., Alpern, H. P., & Maier, S. F. Coping and seizure susceptibility: Control over stress protects against seizures. Presented at Society for Neuroscience meetings, Anaheim, CA, **1984**. Society for Neuroscience Abstracts, p. 1065.

Maier, S. F. Learned helplessness: Some behavioral, theoretical, and pharmacological considerations. Presented at MacArthur Foundation Conference on Recent Advances in the Experimental Analysis of Behavior: Implications for Future Research on Affective Disorders. Palo Alto, CA, **1984**.

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- Minor, T. R., Pelleymounter, M. A., & Maier, S. F. Role of forebrain norepinephrine (NE) in stress-induced deficits in choice performance. Presented at Society for Neuroscience meetings, Anaheim, CA, **1984**. Society for Neuroscience Abstracts, p. 1174.
- Ryan, S. M., & Maier, S. F. Bi-directional effects of estrus cycle on choice performance in stressed and non-stressed rats. Presented at Society for Neuroscience meetings, Anaheim, CA, **1984**. Society for Neuroscience Abstracts, p. 825.
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- Drugan, R. C., Ryan, S. M., Minor, T. R., & Maier, S. F. Librium prevents the analgesia and shuttlebox escape deficits typically observed following inescapable shock. Presented at Society for Neuroscience meetings, Boston, MA, **1983**. Neuroscience Society Abstract, p. 128.
- Laudenslager, M. & Maier, S. F. *In vitro* immunosuppression associated with behavioral learned helplessness. Presented at Federation Proceedings, Chicago, IL, **1983**. Abstract, Vol. 42.
- MacLennan, A. J., Pelleymounter, M. A., & Maier, S. F. Stress-induced increase in frontal cortex D2 dopamine binding. Presented at meeting of International Society for Neurochemistry, Vancouver, B.C., **1983**. Journal of Neurochemistry.
- Maier, S. F. Coping and pain mechanisms. Presented at Winter Conference on Brain Research, Keystone, CO, **1983**.
- Maier, S. F. Learned helplessness effects on lymphocyte proliferation. Paper presented at meetings of Biofeedback Society of America, Denver, CO, **1983**. Biofeedback Society Abstracts, p. 43.
- Ryan, S. M., Laudenslager, M., & Maier, S. F. Corticosterone levels in the learned helplessness paradigm. Presented at Society for Neuroscience meetings, Boston, MA, **1983**. Neuroscience Society Abstract, p. 1122.
- Shavit, Y., Ryan, S. M., Lewis, J. W., Laudenslager, M. L., Terman, G. W., Maier, S. F., Gale, R. P., & Liebeskind, J. C. Inescapable but not escapable stress alters immune function. Presented at meeting of American Physiological Society, Honolulu, HI, **1983**. *The Physiologist*, **26**, p. 64.
- Grau, J. W., & Maier, S. F. Increased reactivity to morphine following exposure to uncontrollable shock. Presented at Eastern Psychological Association, Baltimore, MD, **1982**.

- Maier, S. F. Learned helplessness, pain, and opiates. Invited address presented at Eastern Psychological Association, Baltimore, MD, **1982**.
- Drugan, R. C., Grau, J. W., Maier, S. F., Madden, J., & Barchas, J. D. Cross-tolerance between morphine and the long-term analgesic reaction to inescapable shock. Paper presented at Rocky Mountain Psychological Association, Denver, CO, **1981**.
- Drugan, R. C., Misanin, J. R., & Maier, S. F. The impact of inescapable shock on the sensitivity and reactivity to stress in the rat. Paper presented at Rocky Mountain Psychological Association, Denver, CO, **1981**.
- Grau, J. W., & Maier, S. F. Correlation between morphine analgesia and the long-term analgesic reaction to inescapable shock. Paper presented at Rocky Mountain Psychological Association, Denver, CO, **1981**.
- Grau, J. W., & Maier, S. F. Opioid and nonopioid analgesic reactions observed within-subjects exposed to intermittent shock. Paper presented at Rocky Mountain Psychological Association, Denver, CO, **1981**.
- Hyson, R. L., Grau, J. W., Drugan, R. C., & Maier, S. F. Learned helplessness: Analgesia and the shuttlebox escape deficit. Paper presented at Rocky Mountain Psychological Association, Denver, CO, **1981**.
- Maier, S. F. Learned helplessness, pain inhibition, and the endorphins. Presented at Symposium on Endogenous Mechanisms of Pain Inhibition. Rocky Mountain Psychological Association, Denver, CO, **1981**.
- Maier, S. F., Drugan, R. C., Grau, J. W., Hyson, R. L., MacLennan, A. J., Madden, J., & Barchas, J. D. Opioid and nonopioid mechanisms of long-term analgesia. Neuroscience Society Abstract, **1981**, p. 166.
- Maier, S. F., Drugan, R. C., Hyson, R. L., MacLennan, A. J., Madden, J., & Barchas, J. D. Opioid and nonopioid mechanisms of stress-induced analgesia. Presented at International Narcotic Research Conference, Kyoto, Japan, **1981**.
- Maier, S. F., Grau, J. W., Hyson, R. L., Madden, J., & Barchas, J. D. Learned helplessness and the activation of opioid systems. Presented at Psychonomic Society, Philadelphia, PA, **1981**.
- Jackson, R. L., Alexander, J. H., & Maier, S. F. Perceptual-associative deficits and learned helplessness. Paper presented at Rocky Mountain Psychological Association, Denver, CO, **1978**.

- Alexander, J. H., Jackson, R. L., McDaniel, M. A., & Maier, S. F. Learned helplessness: The activity deficit dissipates in time, the associative deficit doesn't. Paper presented at Rocky Mountain Psychological Association, Denver, CO, 1978.
- Maier, S. F., Jackson, R. L., & Rapaport, P. M. Learned helplessness, learned irrelevance, and learned inactivity. Paper presented at Eastern Psychological Association, Boston, MA, 1977.
- Rapaport, P. M., & Maier, S. F. Learned helplessness and food competition dominance. Paper presented at American Psychological Association, San Francisco, CA, 1977.
- Williams, J. L., & Maier, S. F. Therapy and immunization for learned helplessness. Paper presented at American Psychological Association, San Francisco, CA, 1977.
- Maier, S. F. Learned helplessness. Paper presented at Symposium on Cognitive Processes in Animals, Canadian Psychological Association, Toronto, Canada, 1976.
- Maier, S. F. Learned helplessness. Paper presented at International Congress of Applied Psychology, Munich, Germany, 1976.
- Jackson, R. L., Tomie, A., & Maier, S. F. Learned helplessness in rats: Effects of response produced feedback. Paper presented at Rocky Mountain Psychological Association, Salt Lake City, UT, 1975.
- Maier, S. F., Jackson, R. L., Tomie, A., & Rapaport, P. M. How to get learned helplessness in rats. Paper presented at Psychonomic Society, Denver, CO, 1975.
- Zahorik, D. M., & Maier, S. F. Beyond learned safety. Paper presented at Psychonomic Society, Boston, MA, 1974
- Maier, S. F. Helplessness: Current animal studies. *Proceedings*, 80th Annual Convention, APA, 1972.
- Maier, S. F. Failure to escape shock: Learned helplessness? Paper presented at Psychonomic Society, St. Louis, MO, 1969.

#### **INVITED ADDRESSES and WORKSHOPS**

- Maier, S. F. Resilience. Plenary Address at the Second annual conference on Resilience, Mainz, Germany. 2016
- Maier, S. F. The role of the prefrontal cortex in resilience. The Grawameyer Award for Psychology, 2016. University of Louisville, 2016.

- Maier, S. F. Resilience, behavioral control, and the medial prefrontal cortex. The Kantor Lecture, Denison University, Denison Ohio 2015.
- Maier, S. F. Cognitive decline with aging: The role of inflammation and microglia. Denison University, Denison Ohio 2015.
- Maier, S. F. The role of neuroinflammation and microglia in the cognitive deficits associated with Downs Syndrome. Downs Syndrome Symposium, Univirsity of Colorado Health Sciences Center, Denver C), 2015.
- Maier, S. F. Resilience, behavioral control, and the medial prefrontal cortex. The Macmillan lecture, University of Vermont, Burlington Vermont. 2015.
- Maier, S. F. Resilience. Symposium Speaker, Society for Neurosicence, Washington D.C., 2014.
- Maier, S. F. Behavioral control. Keynote speaker, Neuroscience Day, Medical University of University of South Carolina, Charlston South Carolina, 2014
- Maier, S. F. Glucocorticoids can be pro-inflammatory. Endocrine Society, 2013
- Maier, S. F. Aging-induced cognitive vulnerability to infection and injury: Role of microglia. UC Davis Mind Institiute, 2012
- Maier, S. F. Glucocorticoids are not always anti-inflammatory. Invited Address at Psychoneuroimmunology research society, San Diego, 2012.
- Maier, S. F. My life in Neuroscience: Lessons learned. Campuswide Address, The Autonomous University of Barcelona, Barcelona, Spain, 2011
- Maier, S. F. Lessons from the neurobiology of stress for PNI. Invited Address at Psychoneuroimmunology Research Society meetings, Chicago, 2011.
- Maier, S. F. Microglial priming, neuroinflammation, and susceptibility to peripheral inflammation-induced cognitive decline with aging. Invited address, Cognitive Aging Summit II, National Institute of Aging, Washington DC, 2010.
- Maier, S. F. Resilience and vulnerability: The role of the medial prefrontal cortex. Experimental Biology, ASPET symposium on Catecholamines, Stress, and Cognition. 2010
- Maier, S. F. The ventral medial prefrontal cortex regulates vulnerability and resilience to adverse experiences. American Psychological Association Distinguished Research Career Invited lecture, Toronto, 2009.
- Maier, S. F. Resilience and vulnerability: Role of the medial prefrontal cortex. Presented at Depression Symposium, Cold Springs Harbor, New York, 2009.

- Maier, S., F. Role of the medial prefrontal cortex in coping and resilience. Presented at A Brain Research Meeting: Stress, coping, and disease. Sattelite Conference, Society for Neuroscience, Arlington, VA, 2008.
- Maier, S. F. 5-HT in stress and coping: An animal model related to anxiety and/or depression. Presented at Champalimaud Neuroscience Workshops , Theoretical and Experimental Perspectives on Serotonin Function, Sintra Portugal., 2007.
- Maier, S. F. Role of the medial prefrontal cortex in mediating resilience to adverse events. Presented at NIH Workshop on Cognition and Stress: Advances in Basic and Translational Research. Bethesda, MD, 2007.
- Maier, S. F. The medial prefrontal cortex and resilience. Presented at Society for Behavioral Endocrinology, Asilomar California, 2007.
- Maier, S. F. Where in the brain are vulnerability and resiliency localized? Presented at Depression –Brain causes, body consequences. Institute of Psychiatry, Royal Society of Medicine, London. 2007.
- Maier, S F. Immune-to-brain communicartion. Presented at Immunology and Autism Workshop, Cure Autism Now, Pasadena, 2007.
- Maier, S. F. Glial priming , pro-inflammatory cytokines, aging, and memory. Presented at Psychoneuroimmunology Research Society, Miami, 2006.
- Maier, S. F. Stressor controllability and interactions between serotonergic brainstem nuclei and the prefrontal cortex: Implications for anxiety and reactions to drugs of abuse. Presented at National Institute for Drug Abuse, Baltimore, 2006.
- Maier, S. F. Glial priming, cytokines, and memory. Presented at American Psychosomatic Society Meetings, Denver, 2006.
- Maier, S. F. The impact of early life infection on cognition. American College of Neuropsychopharmacology, Kona Hawaii, 2005.
- Maier, S. F. The role of the medial prefrontal cortex in stressor controllability phenomena. Presented at EMPATHY Symposium, American Psychological Association, Washington D. C., 2005.
- Maier, S. F. & Watkins, L. R. Immune-to-brain communication: Implications for understanding cognition and pain. Invited Plenary Address, American Psychosomatic Society, Vancouver, 2005.
- Maier, S. F. Glial priming, cytokines and cognitive function in aging. Presented at NIH Workshop on Inflammation, Inflammatory Mediators, and Aging. Bethesda, MD., 2004.



- Maier, S. F. Aging and memory—the role of cytokines and brain derived neurotrophic factor. Presented at meetings of Psychoneuroimmunology Research Society, Titisee Germany, **2004**
- Maier, S. F. Immune-to-brain communication and cancer symptoms. Presented at conference on Mechanisms and Treatments of Cancer-related symptoms, the MD Anderson Cancer Center, Houston, TX. **2004**.
- Maier, S. F. Cytokines, cognitive impairment, and depression. Presented at conference on Mechanisms and Treatments of Cancer-related symptoms, the MD Anderson Cancer Center, Houston, TX. **2004**.
- Maier, S. F. Bi-directional immune-to-brain communication. Presented at the National Institutes of Health, Neuroimmunology Group, Integrative Neuro-Immune Interactions Lecture series, Bethesda, MD. **2003**
- Maier, S. F. The role of the dorsal raphe in mediating the consequences of exposure to uncontrollable stress. Presented at the American College of Neuropsychopharmacology, San Juan, Puerto Rico, **2003**.
- Maier, S. F. Brain cytokines: Implications for understanding stress, depression, and memory. Presented at Avigen, Inc., Oakland CA, **2003**.
- Maier, S. F. Brain cytokines and memory. Presented at the Symposium on Brain Cytokines at the meetings of the American Association of Immunology, Denver, CO, **2003**.
- Maier, S. F. Bi-directional communication between the brain and the immune system. Presented at Symposium on Neurobiological Mechanisms of Emotion and Health, sponsored by the Health and Emotions Research Institute, Madison Wisconsin, **2003**.
- Maier, S. F. Bi-directional communication between the brain and the immune system: Implications for understanding stress, mood, and cognition. Presented at Symposium on Stress and the Brain, Brain Awareness Week, the National Institutes of Health, Bethesda, MD. **2003**.
- Maier, S. F. Bi-directional communication between the brain and the immune system: Implications for understanding chronic fatigue. Presented at Centers for Disease Control Workshop on Chronic Fatigue Syndrome, Cold Springs Harbor, NY, **2003**.
- Maier, S. F. Stressor controllability, serotonin and drugs of abuse: All stressors and drugs are not the same. Presented at NIAAA Workshop on Stress and Alcohol Abuse, Washington, D.C., **2002**.

- Maier, S. F. the role of brain cytokines in memory formation. Presented at the meetings of the International Society for Neuroimmunomodulation, Montpellier, France, **2002**.
- Maier, S. F. Implications of the bidirectional communication between the brain and immune systems. The Norman Cousins Memorial lecture, presented at the meetings of the Psychoneuroimmunology Research Society, Madison WI, **2002**.
- Maier, S. F. Immune-brain communication: Implications for Cancer. Presented at Workshop on Biological Mechanisms of Psychosocial Effects on Disease, sponsored by Division of Cancer control and Population Sciences, Basic Biobehavioral Research Branch, the National Institutes of Health. Bethesda, **2002**.
- Maier, S. F. Immune-to brain communication. Presented to the Conference on Biological Mechanisms in Social connectedness and Health sponsored by the Robert Woods Johnson Foundation. Tuscon Arizona, **2002**.
- Maier, S. F. Bi-directional communication between the brain and the immune system: Implications for understanding stress, mood, and cognition. The Neal Miller Distinguished Lecture, presented at the American Psychological Association, San Francisco, **2001**.
- Maier, S. F. The role of brain serotonergic systems in anxiety and stress. Presented at American Society for Sleep Research, Chicago, **2001**.
- Maier, S. F. Interleukin-1, the hippocampus, and memory. Presented at the Psychoneuroimmunology Research Society, Utrecht, the Netherlands, **2001**.
- Maier, S. F. Immune-to-brain communication: possible implications for cancer related fatigue. Presented at Third international Meeting on Cancer and Fatigue, the MDAnderson Cancer Center, Houston, TX, **2001**.
- Maier, S. F. Bi-directional communication between the immune system and the brain: Implications for the understanding of stress and depression. Presented to the Society for Research in Psychopathology annual Meeting, Boulder, CO, **2000**.
- Maier, S. F. Brain interleukin-1 and memory formation. Presented at Cytokines and the Brain 2, a Satellite Symposium to the Society for Neuroscience Annual meeting, **2000**.
- Maier, S. F. Animals models of stress and depression. Presented at the Psychoneuroimmunology Society Meetings, Wilmington NC, **2000**.
- Maier, S. F. An overview of neural-immune interactions. Presented at Rocky Mountain Society for Neuroscience Meetings, Denver, **2000**.

The role of the vagus nerve and brain interleukin-1 beta in immune-to-brain communication. Invited plenary lecture, the 7<sup>th</sup> Annual Conference on Neuroimmune Circuits & Infectious Disease, National Institute of Health, Bethesda MD, **1999**.

The immune system is a diffuse sense organ: Implications for psychology. Invited address, the American Psychological Society, Denver, **1999**.

The organization of brain cytokines systems. Invited lecture, NIH Workshop on Sleep, Sleep Disorders, and the Immune System. Bethesda, MD, **1999**.

Stress, Learned Helplessness, and Brain Interleukin-1. Invited lecture, 5th World Congress on Biomedical Sciences, **1998**.

Stress, learned helplessness, and brain interleukin-1. Invited address, Association pou la Neuro Psycho Pharmacologie Symposium on Stress, Cytokines, and Depression, **1998**, Roscoff, France.

The dynamic regulation of pro-inflammatory cytokines. Invited address, Association pou la Neuro Psycho Pharmacologie Symposium on Stress, Cytokines, and Depression, **1998**, Roscoff, France.

Immune-to-brain communication: I. Invited presentation at NIMH Workshop on Psychoneuroimmunology, Kansas City, **1998**.

Immune-to-brain communication: II. Invited presentation at NIMH Workshop on Psychoneuroimmunology, Kansas City, **1998**.

The role of the peripheral vagus nerve in cytokine-to-brain communication. Invited address, Federated Associations of Societies of Experimental Biology, San Francisco, **1998**.

The use of state classification in stress research. Invited lecture at National Institutes of Mental Health Workshop on "Is it Just Context", Potomac Maryland, **1998**.

Learned helplessness: One phenomenon or many. Invited address presented to joint meeting of the British Psychopharmacology Society and the European Psychopharmacology Society, Bath England, **1997**.

Immune-to-brain communication: Can neural pathways account for all the data? Invited address presented at Cytokines and the Brain, Satellite symposium to the Society for Neuroscience, New Orleans, **1997**.

Stressor controllability, anxiety, and serotonin. Invited address at National Institute of Mental Health workshop on Cognitive Factors in Anxiety, Bethesda, Md., **1997**.

Immune-to-brain communication and its role in mediating behavioral and physiological responses to stressors. Invited Plenary Address, XIX All Latin American Congress of Physiology, Caracas, Venezuela, **1997**

Bi-directional immune to brain communication. Invited Plenary Address, 5th International Symposium on Drugs of Abuse, Immunomodulation, and AIDS, Nashville, TN, **1997**.

Maier, S. F. The immune-brain axis and its implications for understanding stress. Invited Distinguished Lecture, Rocky Mountain Psychological Association, Reno NV, **1997**.

The brain-immune axis. Invited lecture, Minnesota Mining and Manufacturing, Inc., Minneapolis MN, **1997**

Maier, S. F. Bi-directional immune-brain communication and its implications in understanding depression. Invited address at Eastern Psychological Association, Washington, D.C., **1997**.

Cytokines and pain. Invited lecture, Zanecca Pharmaceuticals, Inc., Wilmington, DL, **1997**.

Stress & cytokine-brain interactions. Invited address, 40th OHOLO Conference, New Frontiers in Stress Research: Modulation of Brain Function, Zichron Ya'akov Israel, **1996**.

Neural, endocrine, and immune mechanisms of stress-induced immunomodulation. Invited address, 40th OHOLO Conference, New Frontiers in Stress Research: Modulation of Brain Function, Zichron Ya'akov Israel, **1996**.

The cytokine network: Implications for the understanding of stress. Invited plenary address at International Congress of Psychology, Montreal, Canada, **1996**.

The role of the vagus nerve in cytokine-to-brain communication. Invited Plenary Address, International Society for Neuroimmunomodulation Meeting, Bethesda, **1996**.

The role of the vagus in cytokine-to-brain-communication. Invited lecture at National Institutes of Health, Bethesda, Md., **1995**.

Mechanisms of stress-induced immunomodulation. Invited lecture, NIMH Workshop on Non-Neuronal Mechanisms Integrating Brain, Behavior, and Immunity, Bethesda, MD, **1994**

Anxiety, serotonin, the dorsal raphe nucleus, and learned helplessness. Invited address presented at American Psychological Society, Washington, D. C. **1994**.

Hormonal mediators of stress-induced reductions in the KLH-specific antibody response. Invited address, Psychoneuroimmunology Research Society Meetings, Miami FL, **1994**.

Stressor controllability and learned helplessness. Invited lecture, NIMH Workshop on Sense of Control, Bethesda, MD, **1993**.

Implications for On- and Off-cells in pain modulation. Invited lecture, International Association for the Study of Pain, Paris, **1993**.

Models of depression based on the learned helplessness hypothesis. Invited plenary Address, Strategies for Studying CNS Active Compounds: Models Screens, and Clinical Syndromes, Madrid, **1992**.

Some links between stress, immune function, and disease. Invited address, the American Psychological Association, Washington D. C., **1992**.

The use of animals in the classroom. Invited lecture, American Psychological Association, Washington D. C., **1992**.

Activators of endogenous analgesia mechanisms. Invited lecture, American Pain Society Meetings, St. Louis, **1990**.

Learned helplessness, pain, endogenous opiates, and the immune system. Invited Plenary Address, , Rocky Mountain and Western Psychological Associations, Reno NV, **1989**.

Behavioral Immunology. Invited lecture, Council of American Science Writers, Baltimore, MD, **1985**.

Controllability and pain. Presented at New York Academy of Sciences Symposium on Stress and Pain, New York, NY, **1985**.

Learned helplessness, endogenous opiates, and immune function. Invited lecture, Federation of Behavioral, Psychological, and Cognitive Sciences, Washington, D. C., **1984**

Some behavioral, theoretical, and pharmacological considerations. Invited lecture, MacArthur Foundation Conference on Recent Advances in the Experimental Analysis of Behavior: Implications for Future Research on Affective Disorders. Palo Alto, CA, **1984**.

*In vitro* immunosuppression associated with behavioral learned helplessness. Invited lecture, Federated Associations of Societies of Experimental Biology, Chicago, IL, **1983**.

Learned helplessness, depression, analgesia, and opiates. Invited lecture, American College of Neuropsychopharmacology, Puerto Rico, **1982**.

Learned helplessness, pain, and opiates. Invited address, Eastern Psychological Association, Baltimore, MD, **1982**.

Learned helplessness, pain inhibition, and the endorphins. Invited address, Rocky Mountain Psychological Association, Denver, CO, **1981**.

Opioid and nonopioid mechanisms of stress-induced analgesia. Invited address, International Narcotic Research Conference, Kyoto, Japan, **1981**.

Learned helplessness: Associative deficits, inactivity, analgesia, and endorphins. Invited address, Canadian Psychological Association, Calgary, Canada, **1980**.

Learned helplessness, learned irrelevance, and learned inactivity. Invited lecture, at Eastern Psychological Association, Boston, MA, **1977**.

Therapy and immunization for learned helplessness. Invited lecture, American Psychological Association, San Francisco, CA, **1977**.

Learned helplessness. Invited lecture, Canadian Psychological Association, Toronto, Canada, **1976**.

Learned helplessness. Invited address, International Congress of Applied Psychology, Munich, Germany, **1976**.

Learned helplessness. Invited address, Rocky Mountain Psychological Association, Denver, CO, **1974**.

### **INVITED COLLOQUIA AT OTHER UNIVERSITIES**

Microglia and aging. University of California,, the MIND Institute, Davis, California, 2012.

The role of the mPFC in resilience and vulnerability to stress. University of Maryland Medical Center, Baltimore, 2012.

Cognitive decline. Colorado chapter, Phi Beta Kappa. Denver, 2012.

Aging-induced cognitive vulnerability to infection and injury: Role of microglia. University of Texas at Austin, 2011.

Resiliency in the face of adversity: The role of stressor controllability and the ventral medial prefrontal cortex. University of Massachusetts. The Tay Gavin Erickson Lecture. 2011.

Stressor controllability and the medial prefrontal cortex. Boston College, 2011.

Resilience and vulnerability: Role of the medial prefrontal cortex. Dalhousie University. Annual Hebb Lecture. 2011.

Aging-induced cognitive vulnerability to infection and injury: Role of microglia. University of Arizona, McKnight Foundation, 2011.

Resilience and vulnerability: Role of the medial prefrontal cortex. Vanderbilt University, 2010.

Resilience and vulnerability: Role of the medial prefrontal cortex. University of Colorado Health Sciences Center, Grand Rounds, 2009.

Resilience to adverse events: role of the medial prefrontal cortex. Washington University, St. Louis, 2009.

The medial prefrontal cortex. University of New South Wales, 2008.

Resilience to adverse events: role of the medial prefrontal cortex. University of Pittsburgh, 2008.

Immune-to-brain communication: Cognition and Aging. University of Colorado, 2008.

Immune-to-brain communication: Cognition and Aging. Stanford University, Department of Psychiatry, 2008.

The medial prefrontal cortex and resistance to stress. University of Michigan, Psychiatry Grand Rounds, 2007.

Resilience to adverse events: role of the medial prefrontal cortex. University of Pennsylvania, 2007.

The role of the medial prefrontal cortex in vulnerability and resilience. University of Denver, 2007

The role of the medial prefrontal cortex in resilience. Yale University, 2006

Stressor controllability and interactions between brainstem nuclei and the medial prefrontal cortex: Implications for understanding anxiety and reactions to drugs of abuse. Keynote Speaker, Neuroscience Day, University of Michigan, 2005.

Stressor controllability and interactions between brainstem nuclei and the medial prefrontal cortex: Implications for understanding anxiety and reactions to drugs of abuse. Keynote Speaker, Neuroscience Day, Temple University, **2005**.

How the brain and the immune system talk: Implications for stress, mood, and cognition. Boston University, **2004**.

Learned helplessness and stressor controllability: How the brain does it. Campus Wide Distinguished Lecture, University of Georgia, **2004**.

Bi-directional communication between the brain and the immune system: Implications for understanding stress, mood, and cognition. Department of Psychology, University of Florida, **2003**.

Communication between the immune system and brain modulates mood and cognition. National Institutes of Mental Health, Neuroimmunology Branch, Bethesda. MD. **2003**.

Bi-directional communication between the brain and the immune system: Implications for understanding, stress, mood, and cognition. University of California at Los Angeles, Cousins Center for Psychoneuroimmunology **2003**

Stressor controllability, anxiety, and serotonin. University of Iowa, **2003**.

Bi-directional communication between the brain and the immune system: Implications for understanding, stress, mood, and cognition. University of Iowa, **2003**

Stressor controllability, anxiety, serotonin, and drug abuse. Roche Pharmaceuticals, **2002**.

Bi-directional communication between the brain and the immune system: Implications for understanding, stress, mood, and cognition. Washington University, St. Louis, **2001**.

Bi-directional communication between the brain and the immune system: Implications for understanding, stress, mood, and cognition. Spellman University Departments of Psychology and Biology, **2001**.

Bi-directional communication between the brain and the immune system: Implications for understanding, stress, mood, and cognition. University of Colorado at Denver, Department of Psychology, **2001**.

Stressor controllability, anxiety, and serotonin. Emory University, School of Medicine, Center for Behavioral Neuroscience, **2001**.



Bi-directional communication between the immune system and the brain: Implications for the understanding of aging. Huffington Center on Aging, Baylor University School of Medicine, **2000**.

Immune-endocrine interactions. University of Colorado Health Sciences Center, Department of Endocrinology, **2000**.

Bi-directional communication between the brain and the immune system: Implications for stress and depression. Bates College, the Bittner Distinguished Lecture, **2000**.

Learned helplessness: A neurobiological perspective. Bates college, Department of Psychology, **2000**.

The immune system as a sensory system: Implications for psychology. The University of New Mexico, Department of Psychology, **2000**.

The implications of neural-immune interactions for understanding behavior, mood, and cognition. Rutgers University, the Wyeth-Aherst Lecture, **2000**.

Bi-directional brain-immune communication. Loyola University School of Medicine, Departments of Cell Biology, Immunology, & Neurobiology, **1999**.

Bi-directional brain-immune communication: Implications for understanding stress and depression. Furman University, All University McMahon Lecture, **1999**.

Learned helplessness revisited: A neurobiological perspective. Ohio State University, Department of Psychology, **1999**.

Immune-brain pathways: Implications for neuroimmunomodulation. The Shriver Center and Tufts University, All Center Colloquium, **1999**.

Reciprocal connections between the brain and the immune system regulate both neural and immune processes. Ohio State University School of Medicine, Department of Microbiology and Immunology and Department of Neuroscience, **1999**.

Immune system regulation of the brain: Implications for understanding sickness, stress, and depressed mood. University of Wisconsin, All University Lecture sponsored by the Departments of Psychology and Psychiatry, **1999**.

Stressor controllability, the dorsal raphe nucleus, and anxiety. University of California at Los Angeles, Department of Psychology, **1998**.

Bi-directional neural-immune processes regulate pain. Barrows Neurological Research Institute, **1998**.

Immune system regulation of the brain: Implications for understanding sickness, stress, and depressed mood. Columbia University, Department of Psychology, **1998**.

Learned helplessness, brain serotonin, and anxiety. Texas A & M University, Department of Psychology and Department of Neuroscience, **1998**.

Bi-directional brain-immune communication: Implications for understanding stress-specific immunity interactions, mood, and cognition. University of California at Los Angeles School of Medicine, Department of Psychiatry, **1998**.

The immune system communicates to the central nervous system via neural routes. University of Tennessee School of Medicine, Department of Physiology and Biophysics, **1997**.

Immune system regulation of the brain: Implications for understanding sickness, stress, and depressed mood. University of Pennsylvania, Department of Psychology, **1997**.

Bi-directional interactions between the brain and the immune system regulate behavior, mood, and cognition. All University Lecture, Swarthmore College, **1997**.

Immune system regulation of the brain: Implications for understanding sickness, stress, and depressed mood. University of Colorado School of Medicine, Department of Psychiatry, **1997**.

Bi-directional brain-immune communication: Implications for understanding stress-specific immunity interactions, mood, and cognition. McMaster University School of Medicine, departments of Immunology and Pharmacology, **1997**.

Immune-to-brain communication: The role of the vagus nerve. National Institutes of Mental Health, Neuroimmunology Interest Group, **1997**.

Stressor controllability, serotonin, the dorsal raphe nucleus, and anxiety. North Texas Consortium of Neuroscience Programs, **1996**

Bi-directional brain-immune communication: Implications for understanding stress-specific immunity interactions, mood, and cognition, Louisiana State University School of Medicine, **1996**.

Reciprocal connections between the brain and the immune system regulate both neural and immune processes. The University of Texas at Austin, Department of Psychology, **1996**.

Stressor controllability, serotonin, the dorsal raphe nucleus, and anxiety. The University of Texas at Austin, Department of Psychology, **1996**.

Immune system regulation of the brain: Implications for understanding sickness, stress, and depressed mood. The University of New Hampshire, All University Lecture, **1996**.

Reciprocal connections between the brain and the immune system regulate both neural and immune processes. Ohio State University School of Medicine, Department of Microbiology and Immunology and Department of Neuroscience, **1996**.

Reciprocal connections between the brain and the immune system regulate both neural and immune processes. The University of Vermont, Department of Psychology, **1995**.

Stressor controllability, learned helplessness, and anxiety. University of California at Los Angeles, Department of Psychology, **1995**.

Bi-directional brain-immune communication: Implications for understanding stress-specific immunity interactions, mood, and cognition. University of New Mexico Medical Center, Department of Physiology, **1995**.

Stressor controllability, serotonin, the dorsal raphe nucleus, and anxiety. The University of Colorado at Denver, Department of Psychology, **1995**.

Immune system regulation of the brain: Implications for understanding sickness, stress, and depressed mood. The University of Illinois, Department of Psychology, **1994**.

Stressor controllability, serotonin, the dorsal raphe nucleus, and anxiety. The University of Colorado, Department of Psychology, **1994**.

Stress and immunity. University of California at San Diego, Department of Psychology, **1994**.

Stress, immunity, and brain serotonin systems. Ohio State University, Department of Psychology, **1993**.

How the brain and the immune systems interact. The University of Georgia, Departments of Psychology and Neuroscience, **1993**.

Learned helplessness, stressor controllability, and anxiety. The University of Iowa, Department of Psychology, **1992**.

Stress and immunity. University of Nevada Medical Center, Department of Pharmacology, **1992**.

Interactions between the immune and central nervous systems. The University of Virginia, Department of Psychology, **1991**.

Stressor controllability, learned helplessness, and immune function. Yale University, Department of Psychology, **1991**.

Stressor controllability, endogenous opioids, and stress-induced analgesia. Duke University, Department of Psychology, **1991**.

Learned helplessness, endogenous opioids, and pain modulation. The University of Wisconsin School of Medicine, Department of Psychiatry, **1990**.

Stressor controllability, endogenous opioids, and immune function. Princeton University, Department of Psychology, **1990**.

The brain and the immune system interact: Implications for understanding disease. Lawrence College, Phi Beta Kappa Visiting Scholar lecture, **1989**.

The brain and the immune system interact: Implications for understanding disease. Lehmann College of the City University of New York, Phi Beta Kappa Visiting Scholar lecture **1989**.

The brain and the immune system interact: Implications for understanding disease. St. Catherine's College, Phi Beta Kappa Visiting Scholar lecture **1989**.

The brain and the immune system interact: Implications for understanding disease. Skidmore College, Phi Beta Kappa Visiting Scholar lecture, **1989**.

The brain and the immune system interact: Implications for understanding disease. University of Tulsa, Phi Beta Kappa Visiting Scholar lecture, **1988**.

The brain and the immune system interact: Implications for understanding disease. Whitman College, Phi Beta Kappa Visiting Scholar lecture, **1988**.

The brain and the immune system interact: Implications for understanding disease. Wooster College, Phi Beta Kappa Visiting Scholar lecture, **1988**.

Learned helplessness and endogenous opioids. University of Pennsylvania, Department of Psychology, **1987**.

Stressor controllability, endogenous opioids, and pain modulation. University of Texas Health Sciences Center Department of Psychiatry and the Dallas Veterans Administration, **1987**.

Models of stress and coping. Brown University, Department of Psychology, **1986**.

Stress and immune function. University of Colorado Health Sciences Center, Department of Psychiatry, **1986**

Stress and endogenous opioids. The Johns Hopkins University, Interest Group in Endogenous Opioid, **1986**.

Stress, coping, and endogenous opioids. University of Wisconsin, Department of Psychology, **1985**.

The organization of endogenous opioid systems and their implications for understanding stress and coping. The University of North Dakota Medical Center Grand Rounds, **1985**.

Stress and immunity. The University of Washington School of Medicine, Department of Psychiatry, **1985**.

Endogenous opioid systems, analgesia, and coping. The University of Wyoming, Department of Psychology, **1984**.

Stressor controllability, learned helplessness, and endogenous opioids. Purdue University, Department of Psychology, **1984**.

Animal models of psychiatric disorders and learned helplessness. The University of California At Berkeley, Department of Psychology, **1983**.

Control over the environment: Endogenous opioids and pain modulation. The University of California at San Diego, **1983**.

Control over the environment: Endogenous opioids and pain modulation. The University of Denver, **1983**.

Stress can alter immune processes: The role of psychological variables. Stanford University School of Medicine, Department of Psychiatry and Behavioral sciences, **1982**.

Stress can alter immune processes: The role of psychological variables. The Florida Institute of Technology, **1982**.

Learned helplessness. Stanford University, Department of Psychology, **1981**.

Control over the environment: Endogenous opioids and pain modulation. The University of Florida, Department of Psychology, **1981**.

Stressor controllability, learned helplessness, endogenous opioids, and pain modulation. State University of New York at Stony Brook, Department of Psychology, **1980**.

Contingency and control. Swarthmore College, Department of Psychology, **1980**.

Learned helplessness, contingency, and implications for the psychology of learning. University of "California at Los Angeles, Department of Psychology, **1978**.

Learned helplessness, contingency, and implications for the psychology of learning. McMaster University, Department of Psychology, **1976**.

Learned helplessness, contingency, and implications for the psychology of learning. The University of Pennsylvania , Department of Psychology, **1976**.